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of a sheep not rendered immune against the disease; the blood of the rabbit killed off many bacteria, more, in fact, than the blood of sheep, sheep being, as is well known, much more susceptible to the disease than rabbits. On the other hand, the blood of a mouse had no visible effect on bacilli, in the latter case the animal being extremely sensitive to the disease. That the animal cells do not play any thing like the active rôle frequently assigned to them ('Phagocyte' theory of Metschnikoff and followers) is pretty clearly shown, it being found that the bacteria die off quite independently of the cells or leucocyte in and out of the body. Of saprophytic bacteria some forms are found more sensitive than others. Fluids taken from various individuals of the same species vary to some extent in their germicidal qualities. To give an idea of the intensity of this action, a case or two might be cited. Five drops of defibrinated rabbit's blood, placed at 37–38° C., reduces the number of anthrax bacilli inoculated into it from about 15,000 to 5 at the end of an hour; in another case, from about 90,000 to 0 at the end of four and five hours. Rabbit humor aqueus (contains little or no cellular elements) reduces the number of anthrax bacilli inoculated into it from about 10,000 to 1, and in another case to 0, at the end of two hours; in fresh human pleuritic exudate, 230 anthrax bacilli are entirely killed off after one and two hours. Human saliva was also found to kill off large numbers of bacteria in a short time. The encouraging of bleeding, and the sucking of a wound in certain cases, may not be bad treatment, after all, when we consider the result of the above experimental research.

—Prof. F. W. Clarke describes, in a contribution to the *American Journal of Science*, the results of a series of investigations into the manner of formation of nickel silicates. About the year 1881 extensive deposits of this ore were found in Douglas County, Oregon. They lie near the surface in beds from four to thirty feet thick, and no second beds have been found underlying the first. Most of the samples obtained are intermixed with oxides of iron and with quartz, and are seamed with chalcedony. All of them are undoubtedly products of alteration, which is true of similar samples procured from the deposits in New Caledonia and in North Carolina. The country rock in these three localities is almost identical, consisting of a greenish rock, composed of olivine partially altered into serpentine, and having considerable quantities of enstatite mingled with it. The only noticeable difference in occurrence was that chromic iron, an almost universal associate of the nickel silicates, is absent in Oregon. Analyses of these various ores show great dissimilarity in composition, even between specimens from the same deposit. The percentage of nickel oxide varies from 0.24 to 45.15 per cent, but magnesia is present sometimes to the extent of 22 per cent, and this would lead to suspicions that alteration in the olivine, which is a silicate of magnesia and iron, had something to do with it. Actual analyses of the olivine rock confirmed at least the existence of nickel in it, varying in quantity from 0.10 to 0.26 per cent. Mr. Clarke quotes Dr. T. Sterry Hunt as saying that nickel is almost always present in small quantities in olivine, and rarely absent from the serpentines, steatites (soap-stones), and allied minerals of the Quebec group. As a result of these investigations, Mr. Clarke concludes that the olivine, which always occurs with these ores, and which so readily alters, has supplied the nickel which is found as silicate, not only in Oregon, but at other localities so far observed.

—Those who are obliged frequently to refer to German books are especially interested in the movement to introduce the Roman in place of the Gothic alphabet. Since 1866 the society which is agitating this matter has nearly doubled in numbers. On its lists are now over 4,436 names, including members of all professions, teachers, physicians, booksellers, and merchants. In 1886, out of 6,913 books on artistic, scientific, mercantile, and industrial subjects, 5,316 were printed with the Roman letters.

—J. N. Emra, late lieutenant Royal Marines, has issued a little book (London, Kegan Paul, Trench, & Co.; New York, the author) descriptive of the cruising of H. M. S. 'Royal Oak' in the waters of the Mediterranean. The author calls his book 'The Centre of the Central Sea,' and devotes himself to Malta, Sicily, and an ascent of Mount Etna by some of the officers, describing the phenomena of the volcano as he saw them.

## LETTERS TO THE EDITOR.

## Our Native Birds.

AN editorial paragraph in your issue of Aug. 3 assumes that our native birds have this season been unusually abundant; the assumption being based, so far as appears, upon statements "in the New York papers" and upon "information from Illinois," where "the oldest inhabitant does not remember to have seen so many and such a variety of birds." This is good news,—almost too good,—and, for one, I could wish it better vouched for.

In this part of the country, according to my own observations. (and I have never been more in the field than this year), there has been no such state of things, either during the migratory movement or since. There are days in April, and again in May, as every ornithologist knows, when the woods and fields are fairly alive with migrants. That was true this year, but no truer than it is every year.

This piece of negative evidence proves nothing, of course; and I should hardly have thought it worth offering had even one ornithologist been named as authority for the fact in question. But in such matters mere newspaper reports seem to me of small account, while my acquaintance with the oldest inhabitant of Massachusetts does not incline me to put unqualified faith in the opinions of the oldest inhabitant of Illinois as to the comparative abundance either of individual birds or of species.

In short, I am suspicious of the testimony, and therefore of the facts; but if the facts can be established, then I join you in hoping that the editors of the *Auk* will favor us with an explanation. As for the one already suggested (by "the New York papers," as I infer), it is plainly insufficient, in more ways than one. If the English sparrows were largely or wholly destroyed, it would be an occasion for thankfulness (I speak for myself); but the supposition that their destruction in March would be followed by a great increase in the number of our native birds within two or three months seems to me very unreasonable. BRADFORD TORREY.

Melrose Highlands, Mass., Aug. 5.

REFERRING to the editorial note in your issue of Aug. 3, the failure of ornithological journals to comment on the apparent increase in bird-life during the present season is perhaps an evidence that such comment is uncalled for. It is true that during the vernal migration there was at one time an unusually heavy 'wave' of migrants, the north-bound stream being held in check for several successive days by unfavorable weather. This obstacle being removed, and pleasant weather succeeding, there resulted an overflow of past-due birds, which flooded the country in such accumulated numbers as to excite remark by the most unobservant, as the numerous articles in the daily press of that period will testify.

The migration over, and our avifauna being sifted down to purely summer resident species, a comparison of the number present with those of preceding years yields, so far as my own observations go, remarkably similar results. To illustrate: I find recorded in my note-book on Aug. 5, 1886, observations on thirty-one species observed during a morning's walk. Of these, eight are given as 'common,' three as 'tolerably common,' and the balance as 'two or three,' 'three or four,' etc.; and on Aug. 7, 1887, thirty-five species, of which ten are recorded as 'common,' ten as 'tolerably common,' and the balance as in the preceding; while on Aug. 5, 1888, the result of a walk over exactly the same district was thirty-three species, ten being 'common,' three 'tolerably common,' and the balance as before.

Local observations of this nature, however, can do little more than assist in making a whole, and only from a mass of comparative data can we assert that the number of individuals composing our avifauna during the present year is greater or less than in years preceding.

FRANK M. CHAPMAN.

Englewood, N. J., Aug. 5.

## The Relation between the Sourness of Certain Acid Solutions and the Amount of Acid contained.

THE experiments recorded below are a continuation of some studies on the delicacy of the special senses, by Prof. E. L. Nichols and myself and Mr. E. C. Franklin and myself, the results of which have appeared in *Science*, *Nature*, the Proceedings of the Kansas Academy of Science, and elsewhere. By these investiga-

tions the present line of inquiry was suggested. The question raised was, have all acids that have the same alkali-neutralizing strength the same sourness to the taste? For purposes of testing, a number of 'normal' solutions were made. Thus, for

|                                   |             |
|-----------------------------------|-------------|
| Sulphuric acid, 1 litre contained | 49.0 grams. |
| Hydrochloric " " " "              | 36.5 "      |
| Nitric " " " "                    | 63.0 "      |
| Tartaric " " " "                  | 75.0 "      |
| Citric " " " "                    | 64.0 "      |
| Acetic " " " "                    | 60.0 "      |

The solutions were then of such strength that one cubic centimetre of each would exactly neutralize one cubic centimetre of a normal solution of carbonate of soda.

These solutions were then diluted so that in each series one bottle was of one-half the strength of the preceding one. Of course, a point is soon reached where the acid is so dilute that it is impossible to recognize its presence by the sense of taste. The bottles containing these acids, and some bottles containing only water, were placed without regard to order, and the experimenter was requested to separate into two groups acid and water by tasting the solutions. Those who had the sense of taste more thoroughly developed would be expected to taste the more dilute of the acids. No attempt was made to distinguish between the different kinds of acids. The best method has been found to be to test the solutions rapidly, and pick out the samples about which there could be no doubt, and then to go more carefully over the rest a second time.

In order to obtain the average taste, tests were made by twenty persons, including both sexes and different ages. As the acids are of different apparent strength, the solution of the acids is best seen by a comparison of the most dilute solution tasted in order of strength. This can best be shown by a comparison of the numbers of bottles tested; viz.,—

|                     |                    |
|---------------------|--------------------|
| Sulphuric acid, 7.2 | Tartaric acid, 6.5 |
| Hydrochloric " 7.0  | Citric " 6.8       |
| Nitric " 7.1        | Acetic " 6.3       |

These results agree as closely as could be expected, especially when we consider the unprejudiced position of the experimenter. It will be noticed that the general average of the mineral is a little higher than that of the organic acids. This may be due to a more persistent and characteristic taste in the former. There seemed to be greater uniformity in the tests for sulphuric acid than for any other, as only four detected any acid in the eighth dilution, and none failed to notice it in the seventh. The amount of acid detected, of course, varies with the molecular weights, but the average limit of delicacy is about one part in two thousand parts of water.

For these tests the solutions were frequently renewed. In one case they were allowed to stand for three weeks, when it was found that the three organic acids had lost about all their strength, and at the same time a variety of microscopic organisms had developed at the expense of the acid. These algæ were different in each acid, though some of the same species were found in all. The examination was kindly made by my friend Mr. V. L. Kellogg. It may not be in place to give here the details of this examination, but only to suggest that a great field of investigation lies open in the direction of these lower orders of life and their relation to the destruction of chemically pure substances.

In conclusion, it seems to be true, from what has been stated above, that all acids having the same alkali-neutralizing power are equally sour to the taste, and that the solutions of organic acids rapidly lose their strength.

E. H. S. BAILEY.

Lawrence, Kan., July 27.

#### Beware of the Deadly Alternating Electric Current.

AT the School of Mines of Columbia College this morning, at eleven o'clock, experiments were undertaken, at the request of Harold P. Brown, electrical engineer, to determine the danger of alternating currents, by Dr. Cyrus Edson and Dr. Charles F. Roberts of the New York Board of Health.

The first dog operated upon was a mongrel dog weighing 61 pounds, strong, and in good condition. His height was 24 inches; length from tip of nose to base of tail, 42 inches; and resistance from the right front leg to the left hind leg, 14,000 ohms. Connection was made by binding a piece of cotton waste saturated with water round the leg with No. 20 bare copper wire. The dog was

placed in a cage, and the alternating current applied by Dr. Roberts at 272.16 volts for five seconds; number of alternations, 288 per second. The dog was silent and motionless during the continuance of the current. He gave a few spasmodic gasps thirty-one seconds after current was first applied, and heart ceased beating ninety seconds after current was applied. The dog was immediately dissected by Dr. Roberts and Dr. Peterson, and section of sciatic and pneumogastric nerves, muscular fibres of diaphragm, and lungs, placed under a microscope, and no changes in structure were observed.

The second dog was a full-blooded Newfoundland, strong, and in good condition, weighing 91 pounds; length from tip of nose to base of tail, 48 inches; height, 25 inches; resistance, 8,000 ohms. Connection was made in the same manner as above. Alternating current applied by Dr. Roberts at 340.5 volts electro-motive force for five seconds. The dog was silent and motionless during continuance of current, howled and gasped for eight seconds after circuit was opened; but, in the opinion of physicians present, this was pure mechanical action, as the dog was unconscious from the instant the current first reached him. Heart stopped beating in two minutes and fifty seconds after current was first applied.

The third dog was a half-breed setter and Newfoundland, weighing 53 pounds, 42 inches long from tip of nose to base of tail, and 24 inches high; resistance, 30,000 ohms. Connections were made in the same way as before. Dr. Roberts applied the alternating current at 220 volts for five seconds. The result was not fatal at four minutes afterwards. Mr. Porter, superintendent of machinery of Columbia College, then suggested, that, as the dog was rigid and motionless during the continuance of the shock, it would be impossible for a man in the same conditions to utter a sound or to break the contact in five seconds. Dr. Edson then determined to administer the current at same number of volts for thirty seconds on this account, and on account of the high resistance of this subject. This was done, and during the period of the thirty seconds the voltage rose to 234. The dog died instantly without sound or struggle. The resistance after death was found to be 2,800 ohms.

All the physicians present expressed the opinion that a dog had a higher vitality than a man, and that therefore a current which killed a dog would be fatal to a man under the same conditions. It was their opinion that all of these deaths were painless, as the nerves were probably destroyed in less time than that required to transmit the impression to the brain of the subject.

Dr. Edson invited Prof. Elihu Thomson of Boston, and Dr. Otto A. Moses, to be present with measuring-instruments to check up the voltage, etc.; but neither of these gentlemen put in an appearance or responded.

Dr. CYRUS EDSON, *Pres. Board of Health.*

Dr. CHARLES F. ROBERTS, *Asst. Prof. Physiol.,  
Bellevue Hospital Medical College.*

Dr. FREDERICK PETERSON.

Dr. FRANK H. INGRAM.

Dr. H. A. HAUBALD.

Dr. SCHUYLER S. WHEELER, *Electrician Board  
of Electrical Control.*

HAROLD P. BROWN, *Electrical Engineer.*

Mr. JOHN MURRAY MITCHELL.

Prof. C. E. COLBY, Columbia College.

Capt. E. L. ZALINSKI, U.S.A.

Prof. L. H. LAUDY, Columbia College.

New York, Aug. 3.

#### Note on Breeding-Habits of the Bill-Fish (*Tylosurus longirostris*).

ON the 25th of June last my attention was called by Mr. Ulric Dahlgren of this city to the fact that very young specimens of the bill-fish were to be found in large numbers in the 'feeder' of the Delaware and Raritan Canal, north of the town. A few days later I obtained many specimens, and their size at once showed that they had been hatched at the locality where found. In fact, many still showed traces of the yolk-sac.

So far as I have been able to ascertain, there has been no previous record of the fact that this fish breeds in fresh water, the impression with ichthyologists being that they never deposited their eggs beyond salt-water limits.

CHARLES C. ABBOTT.

Trenton, N. J., July 31.